however conspicuous they may be in fresh material. In the case of *F. recurva* and *F. Gentneri,* however, pistil characters and flower shape can be relied upon for diagnosis under any conditions thus far encountered.

Botany Department
Oregon State College
Corvallis, Oregon

Literature Consulted

Abrams, L. R. 1940. Illustrated flora of the Pacific States. 1: 420–426.
Anderson, J. P. 1945. Flora of Alaska and adjacent parts of Canada. Iowa St. Coll. Jour. Sci. 19: 180.
Beetle, D. E. 1944. A monograph of the North American species of Fritillaria. Madroño 7: 133–159.
Frye, T. C. and G. B. Rigg. 1912. Northwest flora. 453 pp. Seattle.
Hultén, E. 1937. Flora of the Aleutian Islands. 397 pp. Stockholm.
————. 1942. Flora of Alaska and Yukon. 3: 454–456.
Jepson, W. L. 1922. A flora of California. 1: 304–309.
Peck, M. E. 1937. New Plants from Oregon. Proc. Biol. Soc. Wash. 50: 93–94.
————. 1941. A manual of the higher plants of Oregon. 866 pp. Portland.
Piper, C. V. and R. K. Beattie. 1915. Flora of the Northwest Coast. 416 pp. Lancaster, Penn.

A CYTOTAXONOMIC APPROACH TO ESCHSCHOLTZIA

Harlan Lewis and Richard Snow

The genus *Eschscholtzia* has received varied taxonomic treatments during the last half century, ranging from the recognition of over 100 Californian species by Greene (1905) and Fedde (1909) to seven by Jepson (1925). There is good reason to believe that neither of these extremes represents the actual situation. We wish here, however, only to indicate the important contributions that cytological observations can make to an understanding of the relationships and to the delimiting of species within this genus.

One example concerns *Eschscholtzia minutiflora* Watson and *E. Parishii* Greene. *E. minutiflora* is widespread over both the Colorado and Mohave Deserts, and extends into Baja California, Arizona, Nevada, and southern Utah. It is variable throughout this range, but can usually be recognized most readily by its small flowers (petals less than 8 mm. long), and short-apiculate buds. The stamens number about 12, with anthers about as long as the filaments.

Eschscholtzia Parishii, listed in current manuals as a variety of *E. minutiflora* or as a synonym of *E. minutiflora* var. *darwinensis* Jones, has a more restricted range than *E. minutiflora.* It occurs

throughout the Colorado Desert and on the southern margin of the Mohave Desert. Over its entire range it is sympatric with *E. minutiflora* and the two can often be found growing side by side. The distinguishing features are its much larger flowers (petals up to 23 mm. long) and long-apiculate buds. The stamens are about twice as numerous in this species, and the anthers are often longer than the filaments. On the whole, *E. Parishii* is much more variable than *E. minutiflora.*

When these two entities grow side by side, they are completely distinct morphologically and show no evidence of hybridization. Furthermore, observations of pollen mother cells have shown that *E. Parishii* has 6 pairs of chromosomes, while *E. minutiflora* has 18 pairs and is therefore a hexaploid. Thus there is no doubt as to the nature of the barrier restricting gene recombination between these two species.

These two species, then, are apparently genetically isolated and morphologically distinct when found growing together. Nevertheless, a study of herbarium material collected over a great many years, and from a variety of localities, shows that many morphological intermediates do occur between these two species.[1] It is presumably because of these intermediates that some authors have considered these two entities to be conspecific. Lewis and Went (1945) have shown, however, that certain species of *Eschscholtzia,* when grown under controlled conditions, can be modified by the external environment both as to flower size and vegetative characters. Similar modifications have also been observed by Jepson (1922). Thus it would seem probable that environmental modification is primarily responsible for the intermediate phenotypes which obscure the genetic discontinuity between *E. minutiflora* and *E. Parishii.*

The plant described by Jones in 1898 as *E. minutiflora* var. *darwinensis* further complicates the picture. This entity occurs in the Mohave Desert, principally in the Panamint, Funeral, and White mountains, and is also sympatric with *E. minutiflora.* It scarcely overlaps the range of *E. Parishii,* if at all. In several respects, notably in flower size, it is intermediate between *E. Parishii* and *E. minutiflora.* It appears morphologically quite homogeneous, however, and may well represent a third species, possibly a tetraploid, which in combination with *E. Parishii* may have given rise to the hexaploid *E. minutiflora.* Unfortunately, we have not as yet been able to obtain material for chromosome counts or experimental studies.

Eschscholtzia californica and *E. caespitosa* have been previously reported to have a haploid chromosome number of 6 (Darlington and Janaki-Ammal, 1945), and our observations of *E. caespitosa* are in agreement. Thus 6 is apparently the basic number in this

[1] Material has been borrowed from Pomona College and the University of California, Berkeley. The authors wish to thank the curators of these herbaria.

genus. However, an examination of the pollen mother cells of *E. glyptosperma* Greene has shown that it has a haploid number of 7, a number new to this genus.

All of the problems in *Eschscholtzia* cannot be solved by cytological observations, but these examples indicate that they will prove to be of great value in indicating specific limits in this genus.

Specimens Examined Cytologically

E. caespitosa: Davy Brown Camp, San Rafael Mts., Santa Barbara Co. *Lewis,* April, 1950.
E. glyptosperma: Silver Lake-Cave Springs road, Avawatz Mts., San Bernardino Co. *Ball 716.*
E. minutiflora: U. S. Highway 60, 5 mi. west of road to Cottonwood Springs, Riverside Co. *Lewis* and *Ernst,* March 26, 1949. 1 mi. south of Atolia, San Bernardino Co. *Lewis,* April 1950.
E. Parishii: U. S. Highway 60, 5 mi. west of road to Cottonwood Springs, Riverside Co. *Lewis* and *Ernst,* March 26, 1949. Joshua Tree National Monument. *Lewis,* April, 1949.

Department of Botany
University of California
Los Angeles, California

Literature Cited

Darlington, C. D. and E. K. Janaki-Ammal. 1945. Chromosome Atlas of Cultivated Plants. London.
Fedde, F. 1909. Papavaraceae in A. Engler, Das Pflanzenreich. IV (104): 144–202. Leipzig.
Greene, E. L. 1905. Revision of *Eschscholtzia.* Pittonia 5: 205–293.
Jepson, W. L. 1922. Flora of California. Vol. 1. Berkeley.
———. 1925. Manual of the Flowering Plants of California. Berkeley.
Lewis, Harlan and F. W. Went. 1945. Plant Growth Under Controlled Conditions: IV. Response of California Annuals to Photoperiod and Temperature. Am. Jour. Bot. 32: 1–12.

NOMENCLATURAL RECOMBINATIONS IN IDAHO PLANTS

Ray J. Davis

Looking forward to the publication of a "Flora of Idaho" this summer (1951), I am making the following nomenclatural recombinations separate from this book.

Erythronium grandiflorum Pursh var. **idahoense** (St. John & G. N. Jones) comb. nov. *E. idahoense* St. John and G. N. Jones, Res. Stud. St. Coll. Wash. 1: 91. 1929.

Eriogonum caespitosum Nutt. var. **acaule** (Nutt.) comb. nov. *E. acaule* Nutt. Jour. Acad. Phila. Ser. 2, 1: 160. 1848.

Polygonum buxiforme Small var. **montanum** (Small) comb. nov. *P. douglasii montanum* Small, Mem. Dept. Bot. Columbia Coll. 1: 118. 1895.